1. Drawings

A. MPEP §608.02(g)

The Examiner has indicated that under MPEP §608.02(g), Figure 1 should be designated "by a legend such as --PRIOR ART--".

In response, the Applicants provide a corrected copy of the drawings attached hereto. In the corrected copy, Figure 1 is labeled with the legend "RELATED ART." Applicants point out that the purpose of MPEP §608.02(g) is to alert readers to the fact that the Figure is not considered by the inventors as being part of the invention, but is included to help the reader understand the invention. The legend "RELATED ART" performs this function. Applicants also note that MPEP §608.02(g) requires a "legend such as," it does not require the exact words "PRIOR ART."

In light of the corrected drawings attached hereto, Applicants respectfully request the Examiner to withdraw the Objection to the drawings under MPEP §608.02(g).

B. 37 C.F.R. 1.84(p)(5)

The Examiner also has objected to the drawings under 37 C.F.R. 1.84(p)(5) because they include reference numerals that are not employed in the Specification. In one instance, the method steps depicted in Figure 13 are labeled 51300 – 51316. The corresponding text in the specification refers to these steps as s1300 – s1316. In response, the Applicants provide a corrected copy of the drawings attached hereto.

In a second instance, reference numeral 34 in Figure 3 is not explicitly discussed in the Specification. In response, the Applicants have provided an amended version of the second paragraph on page 8. The amended paragraph includes the statement: "[s]nap-on cap 32 includes pressure port 34 which is in communication with cavity 28."

In light of the corrected drawings attached hereto and the amendment provided above, Applicants respectfully request the Examiner to withdraw the Objection to the drawings under 37 C.F.R. 1.84(p)(5).

2. Specification

The Examiner has objected to an informality or typographical error in the specification. In response, the Applicants have provided an amended version of the paragraph wherein the informality is removed.

In light of the amendment provided above, Applicants respectfully request the Examiner to withdraw the Objection to the Specification.

3. Allowed Claims/Subject Matter

Applicant notes with appreciation that the Examiner has indicated the subject matter of claims 36 and 41 – 45 are patentable, and would be allowable if rewritten in independent form.

4. § 112 Rejections

The Examiner has objected to claims 4 – 6, 18, 19, 23 – 25, 36, and 52 under 35 U.S.C. § 112, second paragraph, as being indefinite for lack of antecedent basis for certain limitations in the claims. In response, the Applicant has amended claims 4, 16, 23, 36, and 50.

In claim 4, Applicants have replaced the term "a cap" with the term "a snap-on cap." Claim 16 has been amended to change the dependency from claim 11 to claim 15, to thereby provide proper antecedent basis. Claim 23 was amended to replace the term "environmental" with the term "stimulus." Claim 36 was amended to change the dependency from claim 31 to claim 32 to thereby provide proper antecedent basis. Finally, in claim 50, the phrase "an initial condition ambient condition frequency value" was amended to "an initial condition ambient oscillation frequency value" to thereby provide proper antecedent basis in claim 52.

In light of the amendments provided above, the Applicants respectfully request that the Objection to claims 4 – 6, 18, 19, 23 – 25, 36, and 52 be withdrawn.

5. § 102 Rejections

A. The Examiner has rejected claims 1, 2, 11-14, 20, 59, and 62 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,532,834 to Pinto et al. (hereinafter Pinto).

The Applicants respectfully traverse the Examiner's rejection because he has failed to provide a prima facie case of anticipation, since he has failed to point out where each and every claim element is disclosed in the cited art.

Claim 1 is directed to a capacitive sensor for measuring a stimulus parameter. The sensor includes a circuit board having at least one metallic layer. A metallic diaphragm is coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance. The metallic diaphragm is adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter such that the capacitance changes in accordance with the change in the stimulus parameter. An oscillator circuit including a low-pass filter is coupled to the transducer capacitor. The oscillator circuit is configured to generate a filtered signal characterized by a frequency. The frequency changes in accordance with capacitance changes.

Claim 59 is directed to a capacitive sensor for measuring a stimulus parameter. The sensor has a circuit board including at least one metallic layer. A metallic diaphragm is coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance. The metallic diaphragm becomes substantially curved relative to the at least one metallic layer in response to a change in the stimulus parameter such that the capacitance changes in accordance with stimulus parameter changes. An oscillator circuit is coupled to the transducer capacitor. The oscillator circuit is configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes.

Claim 62 is directed to a capacitive sensor for measuring a stimulus parameter. The sensor has a circuit board including at least one metallic layer. A metallic diaphragm is coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance. The metallic diaphragm does not include an attached metallic plate. The metallic diaphragm is adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter such that the capacitance changes in accordance with stimulus parameter changes. An oscillator circuit is coupled to the transducer capacitor. The oscillator circuit is configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes.

Pinto is directed to a capacitive pressure sensor for measuring a pressure applied to an elastic member. The sensor includes a capacitive plate disposed adjacent to the elastic member so as to define a gap between a planar conductive surface of the elastic member and a corresponding planar surface of the capacitive plate. The gap, capacitive plate and elastic member together define a capacitor having a characteristic capacitance. The sensor further includes an elongated electrical conductor characterized by an associated inductance value. The conductor is mechanically connected to, and electrically coupled with, the capacitive plate. The gap between the capacitive plate and the elastic member varies as a predetermined function of the pressure applied to the elastic member so as to vary the characteristic capacitance. The capacitor and the inductor together form a tank circuit having a characteristic resonant frequency. When the capacitance of the tank circuit is varied, the resonant frequency of the tank circuit is varied in accordance with the pressure applied to the elastic member. The tank circuit also moderates the effects of environmental influences such as temperature variations, vibration and shock.

According to **MPEP 2131**, "to anticipate a claim, the reference must teach every element of the claim." A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The Examiner has failed to point out where Pinto discloses each element in claim 1. For example, claim 1 recites a capacitive sensor that includes a circuit board having at least one metallic layer. The Examiner asserts that reference numeral 214 in Figure 6 of Pinto is a circuit board having a metallic layer. However, Col. 6, lines 65 – 67 (Pinto), identifies reference numeral 214 as an electrode assembly. Thus, Pinto does not disclose a circuit board having at least one metallic layer. Because Pinto does not disclose a circuit board having at least one metallic layer, Pinto cannot possibly disclose a metallic diaphragm coupled to a circuit board either.

The Examiner has failed to point out where Pinto discloses an oscillator circuit that includes a low pass-filter. The Examiner points to Figure 5. However, while reference

numeral 136 is in fact an oscillator circuit, Pinto does not show or a describe a LP filter, as recited in claim 1. The Examiner asserts that reference numeral 132 is a LP filter. However, Pinto states in col. 6, lines 14 – 48, that reference numeral 132 refers to the tank circuit described above. As described by Pinto, the tank circuit is formed by the capacitor plate and the inductor itself, <u>not</u> by components included in the oscillator circuit. Further, as those of ordinary skill in the art will appreciate, a tank circuit is not a low pass filter, it is a resonant circuit, characterized by a resonant frequency, that stores RF energy. The tank circuit is used to set the oscillation frequency used by the Oscillator circuit. The claimed low pass filter circuit is not used to set the oscillation frequency. Another function of the filter is to regulate the oscillator input voltage. Yet another function of the LP filter is to limit high frequency Electro-Magnetic Interference (EMI). The tank circuit does not perform any of these functions. In sum, the Examiner has failed to point out where Pinto discloses an oscillator circuit that includes a low pass-filter.

Claim 59 and 62 are allowable for some of the same reasons. Each of these claims also recite a capacitive sensor that includes a circuit board having at least one metallic layer. Further, the present invention teaches a flexible membrane that is spherical in nature. Pinto does not have that feature either.

Dependent claims 11 – 14 are allowable in their own right. As noted above, the Examiner has failed to point out where Pinto describes an oscillator circuit that includes an LP filter. The Examiner asserts that Figure 4A discloses an LP filter with an impedance element coupled to a first shunt capacitor. However, as described in col. 6, lines 5 – 8, Figure 4A is a schematic of the tank circuit formed by capacitive plate 130 and coil 120. Thus, the Examiner has failed to show where Pinto describes an LP filter that includes an impedance element coupled to a first shunt capacitor.

Thus, the Applicants respectfully assert that claims 1-20, 59, and 62 are allowable under 35 U.S.C. § 102(e). Applicants respectfully request that the rejection under 35 U.S.C. § 102(e) be withdrawn.

B. The Examiner has rejected claims 49 – 58 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,586,108 to Frick. The Applicants respectfully traverse the

Examiner's rejection because he has failed to provide a prima facie case of anticipation, since he has failed to point out where each and every claim element is disclosed in the cited art.

Claim 49 is directed to a method for calibrating a capacitive sensor used to measure a stimulus parameter. The method includes providing a sensor including a capacitor transducer and an oscillator circuit, the capacitor transducer being characterized by a variable capacitance that varies in accordance with a change in the stimulus parameter. A correction factor is determined by comparing an initial condition to an ambient condition. The frequency corresponding to the stimulus parameter is determined during ambient conditions. The stimulus parameter is corrected by multiplying the correction factor by the frequency, whereby a corrected frequency value is obtained.

Frick discloses sensor circuitry for sensing changes in capacitance. The sensor includes a plate that deflects in response to changes in pressure. The sensor provides an output that relates to changes in differential pressure. The sensor includes sensor portions that are fluid filled and in fluid communication with each other so that a deflection of a plate on one of the sensor portions causes an opposite deflection of a plate on the other sensor portion. The circuitry provides a stable output regardless of variations in sensor characteristics.

The Examiner asserts that the step of determining a correction factor is disclosed by Frick in claim 21 (col. 24, lines 9 – 30). The Examiner asserts that the step of determining the frequency is disclosed in column 17, lines 7 – 17, and that the step of correcting is taught in col. 17, lines 20 – 44. The Applicants point out that this is a tacit admission by the Examiner that Frick does not, in fact, disclose a coherent method for calibrating a capacitive sensor because he must resort to picking and choosing isolated parts of the Frick patent to make the rejection.

Claim 49 includes the step of determining a correction factor by comparing an initial condition to an ambient condition. Frick's claim 21 recites in part: "*...means for providing a correction <u>signal</u> ...the correction signal being a function of the series capacitance of the first and second sensing capacitors*." Applicants point out that Frick discloses a correction signal, and not a correction factor. Applicants also point out that Frick's correction signal is a

function of the series capacitance, and is not a correction factor that is derived by comparing an initial condition to an ambient condition. Thus, the Examiner has failed to point out where Frick discloses the step of determining a correction factor, as recited in claim 49.

Claim 49 includes the step of determining a frequency corresponding to the stimulus parameter during ambient conditions. The Examiner relies on col. 17, lines 7 – 17 for the recited method step. The cited text discloses a microprocessor that combines capacitances C1 and C2, and zeroing parameter A, to provide an output N_{out}. In col. 18, lines 4 – 7, Frick states that N_{out} may be used to drive a D/A converter to generate a voltage signal to drive a load. Thus, the cited text does not make any mention of the step of determining a frequency corresponding to the stimulus parameter during ambient conditions. Furthermore, Applicant notes that the internal circuitry of the Frick device operates at a constant frequency. For example, the internal frequency is set by crystal 191 (Figure 5) or oscillator 125 (Figure 4). In light of the above, the Examiner has failed to point out where Frick discloses the step of determining a frequency corresponding to the stimulus parameter during ambient conditions, as recited in claim 49.

Claim 49 includes the step of correcting the stimulus parameter by multiplying the correction factor by the frequency, whereby a corrected frequency value is obtained. The Examiner relies on col. 17, lines 20 – 44 for this feature. The cited text discusses the value N_{out}. The text cites that a first factor representing "fill oil density" is multiplied by a second factor that represents "differential capacitance" less a zeroing constant A. The Applicants make several points. First, the calculation for zeroing constant A is described in col. 11. Since it is not calculated by comparing an initial condition to an ambient condition it cannot anticipate the correction factor. Second, neither of the terms disclosed by Frick represent a frequency – one represents "fill oil density" and the other represents "differential capacitance" less a zeroing constant A. Applicants conclude that the cited text does not disclose or suggest correcting a stimulus parameter, or multiplying a correction factor by a frequency, as recited in claim 49. Thus, the Examiner has failed to point out where Frick discloses the step of correcting as recited in claim 49.

Claims 50 – 58 are allowable in their own right and also by virtue of their dependency from claim 49. For example, claim 50 recites that the step of determining further comprises

the steps of: "obtaining an initial condition factory oscillation frequency value (f_0); obtaining an initial condition ambient oscillation frequency value (f_I); and dividing the initial condition factory oscillation frequency value by the initial condition ambient oscillation frequency value." The Examiner asserts that col. 17, lines 7 – 17 discloses the subject matter of the claim. The Examiner makes this rejection up out of whole cloth. None of the claimed steps are disclosed in the cited text.

In light of the above arguments, the Applicants respectfully assert that claims 49 – 58 are allowable under 35 U.S.C. § 102(b). Applicants respectfully request that the rejection under 35 U.S.C. § 102(b) be withdrawn.

6. § 103 Rejections

A. Pinto in view of Pechoux

The Examiner has rejected claims 3 – 10, 60, and 61 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Pinto in view of U.S. Patent No. 6,418,793 to Pechoux et al. (hereinafter Pechoux). The Applicants respectfully traverse the Examiner's rejection because he has failed to provide a prima facie case of obviousness, since he has failed to point out where each and every claim element is disclosed by the combination, and because he has failed to provide a proper reason for combining.

Claim 60 is directed to a capacitive sensor for measuring a stimulus parameter. The sensor has a circuit board including at least one metallic layer. A metallic diaphragm is coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance. The metallic diaphragm is adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter such that the capacitance changes in accordance with stimulus parameter changes. A conductive ring is disposed between the metallic diaphragm and the circuit board. A pressure port assembly is coupled to the conductive ring, whereby a cavity is formed between a pressure port and the metallic diaphragm. An oscillator circuit is coupled to the transducer capacitor. The oscillator circuit is configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes.

Claim 61 is directed to a capacitive sensor for measuring a stimulus parameter. The sensor has a circuit board including at least one metallic layer. A metallic diaphragm is coupled to the circuit board and juxtaposed to the metallic layer to thereby form a transducer capacitor characterized by a capacitance. The metallic diaphragm is adapted to move relative to the at least one metallic layer in response to a change in the stimulus parameter such that the capacitance changes in accordance with stimulus parameter changes. At least one guard ring is disposed within a thickness of the circuit board. The guard ring is adapted to reduce stray capacitance between the metallic diaphragm and the metallic layer. An oscillator circuit is coupled to the transducer capacitor. The oscillator circuit is configured to generate a signal characterized by a frequency that changes in accordance with capacitance changes.

Pinto was discussed in detail in Section 5.

Pechoux teaches a pressure sensor that includes a differential pair of capacitors having a movable plate. The sensor includes a measurement circuit for measuring the capacitance of the capacitor. The circuit is incorporated in the housing of the sensor and is made up of first and second double-sided interconnected circuits which are situated on either side of the membrane and which are connected thereto in its peripheral region by connection means.

According to the **MPEP 2143**, three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

i.) The prior art references do not teach or suggest all the claim limitations.

Claim 60 and claims 3 - 10:

The Examiner relies on Pinto for the circuit board that includes at least one metallic layer that is recited in claim 60. The Examiner also relies on Pinto for the metallic diaphragm

coupled to the circuit board and juxtaposed to the metallic layer that is recited in claims 60 and 61. As pointed out in the discussion of claim 1 above, Col. 6, lines 65 – 67 (Pinto), identifies reference numeral 214 as an electrode assembly, not as a circuit board.

The Examiner asserts that Pinto teaches "a pressure port assembly that is coupled to the conductive ring, whereby a cavity is formed between a pressure port and the metallic diaphragm," as recited in claim 60 and claims 3 - 10. The Examiner later admits that Pinto does not have a conductive ring. Thus, Pinto cannot have a pressure port assembly that is coupled to the conductive ring.

The Examiner asserts that Pechoux remedies the shortcomings of Pinto. However, the Applicants point out that neither Pinto nor Pechoux, whether taken alone or in combination teach or suggest all of the features recited in claim 60. For example, neither Pinto nor Pechoux, whether taken alone or in combination teach or suggest "a pressure port assembly that is coupled to the conductive ring, whereby a cavity is formed between a pressure port and the metallic diaphragm," as recited in claim 60.

With respect to dependent claims 7 and 8, the examiner attempts to equate the shim 8a in Figure 2 of Pechoux with the metallic land of claim 7. However, the metallic land is separate and distinct from the metallic ring of claim 3 on which claim 7 depends. Shim 8a cannot be both the metallic ring of claim 3 and the metallic land of claim 7 at the same time. The examiner then attempts to represent the shim 8a in Figure 2 of Pechoux as being co-planar with plate 11. Were this shim to be co-planar with plate 11, it would be drawn as embedded in circuit board 13a, not above the board, as shown in Figure 2. On the other hand, the co-planar metallic land feature of claim 8 is described on page 8, line 13-16 of the specification: "metal ring 24 receives structural support from support plate 40, which is disposed between circuit board 12 and metal ring 24. Support plate 40 causes conductive layer 18 and the support plane of metal ring 24 to be coplanar, to thereby reduce mechanical tolerance stack-up." Thus, claims 7 and 8 are also allowable.

With respect to dependent claim 9, the examiner asserts that Pechoux teaches guard rings. This is refuted below in the discussion of claim 61.

ii.) There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

The Examiner argues that one of ordinary skill in the art would be motivated to combine Pechoux with Pinto because they would want to ensure that electrical connections were made so that results were more consistent and accurate. The Examiner relies on col. 4, line 66 to col. 5, line 1.

The Applicants point out that MPEP 2143.01 states that a proposed combination cannot change the principle of operation of the invention being modified. In this case, Pinto employs a single capacitor to measure the pressure in variable pressure region 204 (See Figure 6). The pressure is measured by providing an oscillating signal having a frequency proportional to the pressure. In a col. 4, line 66 to col. 5, line 1, Pechoux discloses metal shims 8, which are used to connect circuit 13a with circuit 13b. The two circuits, 13a and 13b, are connected so as to measure a DC voltage "U," which is a function of the difference between the pressures existing in region 5a and region 5b. One of ordinary skill in the art would not be motivated to combine Pechoux with Pinto, because Pinto has no need for the electrical connections facilitated by the shims (8) disclosed by Pechoux, because Pinto does not require two circuits (13a and 13b). Simply put, the use of the electrical components of Pechoux by Pinto would require a change in the principle of operation of the Pinto invention.

Claim 61:

i.) The prior art references do not teach or suggest all the claim limitations.

The Examiner relies on Pinto for the circuit board that includes at least one metallic layer that is recited in claim 60. The Examiner also relies on Pinto for the metallic diaphragm coupled to the circuit board and juxtaposed to the metallic layer that is recited in claims 60 and 61. As pointed out in the discussion of claim 1 above, Col. 6, lines 65 – 67 (Pinto), identifies reference numeral 214 as an electrode assembly, not as a circuit board.

The Examiner asserts that Pechoux teaches the at least one guard ring recited in claim 61. The Examiner relies on col. 5, lines 29 – 45 for support for his assertion. In the cited text, Pechoux discloses that shims 8 and capacitive plates 11 and 12 do help eliminate stray capacitance. It is true that Pechoux recognizes the problem, but he employs a different solution. Pechoux uses the shims 8 to separate the membrane from plates 11, 12 by a large distance. The present invention employs guard rings. Applicant further points out that Examiner's assertion that plates 11,12 are guard rings is erroneous. Plates 11, 12 are capacitive plates that are used to form two variable capacitors. Applicants point out that capacitive plate 11 reacts with membrane 7 to form the variable capacitor in region 5a, whereas capacitive plate 12 reacts with membrane 7 to form the variable capacitor in region 5b. On the other hand, claim 61 recites a circuit board that includes a metal layer that forms a capacitor with the metallic diaphragm. If plates 11, 12 anticipate the circuit board and metal layer in claim 61, then metal plates 11, 12 cannot anticipate the guard ring recited in claim 61. Simply put, Pechoux does not include the at least one guard ring recited in claim 61.

ii.) <u>There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.</u>

The Examiner argues that one of ordinary skill in the art would be motivated to combine Pechoux with Pinto for the purpose of reducing stray capacitances.

The Applicants point out that MPEP 2143.01 states that a proposed combination cannot change the principle of operation of the invention being modified. In this case, Pinto employs a single capacitor to measure the pressure in variable pressure region 204 (See Figure 6). The pressure is measured by providing an oscillating signal having a frequency proportional to the pressure. Pechoux employs capacitive plates 11 and 12 disposed on either side of membrane 7 to thereby form two variable capacitors. One of ordinary skill in the art would not be motivated to use Pechoux's capacitive plates 11 and 12 in Pinto's device, because it would change the principle of operation of the Pinto reference from a single capacitor sensor to a differential capacitor sensor.

Furthermore, the combination of Pinto and Pechoux is unworkable. In the cited Figure 6, Pinto uses the housing 210a, suspension post 212 and insulator 218 to set the

distance between the plate 216 and (diaphragm) elastic member 202. To one skilled in the art, the combination of Pechoux and Pinto is a difficult if not unworkable arrangement, requiring matching of temperature coefficient of expansion of large-dimensioned members and precision machining of the housing. Applicant suggests that the combination would require a total redesign.

In light of the above arguments, the Applicants respectfully assert that claims 3-10, 60, and 61 are allowable under 35 U.S.C. § 103(a). Applicants respectfully request that the rejection under 35 U.S.C. § 103(a) be withdrawn.

B. The Examiner has rejected claims 15 – 19 and 21 – 30 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Pinto in view of U.S. Patent No. 5,172,065 to Wallrafen. The Applicants respectfully traverse the Examiner's rejection because he has failed to provide a prima facie case of obviousness, since he has failed to point out where each and every claim element is disclosed by the combination, and because he has failed to provide a proper reason for combining.

Claim 21 is directed to a capacitive sensor for measuring a stimulus parameter. The sensor includes a capacitor transducer including a fixed plate member and a variable plate member. The capacitor transducer is characterized by a variable capacitance. The variable capacitance varies in accordance with a change in the stimulus parameter. An oscillator circuit is coupled to the capacitor transducer. The oscillator circuit includes a low-pass filter coupled to an input of the capacitive transducer. The oscillator circuit generates a non-sinusoidal signal having a frequency. The frequency is proportional to the stimulus parameter.

Pinto was discussed in detail above.

Wallrafen teaches an evaluation circuit for a capacitive sensor. The capacitive sensor and a capacitor form a capacitive voltage divider, the end terminals of which can be fed with opposite-phase alternating voltages of the same frequency. The junction point between the capacitor and the capacitive sensor is connected, together with a tap of a voltage source of high internal resistance, to the input of an impedance transformer. The output of the circuit

provides a DC voltage that is proportional to the capacitance measured by the sensor capacitor.

i.) The prior art references do not teach or suggest all the claim limitations.

Claims 15 – 20:

With respect to claim 15, the Examiner in the last paragraph of page 13 (Office Action) incorrectly states that Wallrafen teaches that a second capacitor is connected to AC ground. It is, rather, connected to one of the phases of a differential oscillator in a conventional differentially-driven-half-bridge measurement configuration. This is not at ground potential. Further, his claim that the signal is at ground potential for some infinitesimally small period of time in no way makes it a ground potential signal. Every AC signal crosses ground at some point. It does not make it an AC ground.

With regard to claim 19, the Examiner, in paragraph 4 on page 15, says " Wallrafen discloses the capacitance divider is configured to reduce diode conduction …". After reading Wallrafen twice, the Applicant cannot find the word 'diode' anywhere in the text. It appears as if the Examiner is referring the specification of the instant application.

Claim 21:

As noted above in the discussion of claim 1, the Examiner has failed to point out where Pinto discloses an oscillator circuit that includes a low pass-filter. Claim 21 includes the additional limitation that the oscillator circuit includes a low-pass filter coupled to an input of the capacitive transducer. The oscillator circuit generates a non-sinusoidal signal having a frequency.

The Examiner asserts that Wallrafen supplies the missing features. The Examiner asserts that element 21 in Figure 2 is an oscillator circuit that provides a non-sinusoidal output. Referring to col. 3, lines 55 – 58, element 21 is nothing more that a square wave generator. As noted above in the description of Wallrafen, Wallrafen does not employ an oscillator circuit that produces a frequency proportional to a stimulus parameter. In col. 3, lines 39 – 42, the output of the circuit is a DC voltage proportional to the capacitance. Thus, Wallrafen does not disclose an oscillator that generates a non-sinusoidal signal having a frequency. DC voltages do not have frequencies associated with them.

Claims 22 – 30 depend from claim 21 and are allowable in their own right. In claim 22, first and second circuit loops are recited. These circuits are part of the oscillator circuit because they provide gain to the filtered signals. Thus, the circuit loops comprise the oscillator circuit, further including the capacitive transducer, the frequency varying with the stimulus parameter. In contrast, Wallrafen has the oscillator circuit (voltage source 4A in fig 1) separate from the transducer. Thus, the loops described by the examiner are not part of an oscillator which varies in frequency with the sensed parameter. As a result, claim 22 is allowable in its own right.

In light of the above arguments, the Applicants respectfully assert that claims 15 – 30 are allowable under 35 U.S.C. § 103(a) because the Examiner has failed to point out where the cited references include each limitation found in the claims..

ii.) There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

The Examiner argues that one of ordinary skill in the art would be motivated to combine Wallrafen with Pinto for the purpose of eliminating ripple in the output waveform generated by Pinto.

The Applicants point out that MPEP 2143.01 states that a proposed combination cannot change the principle of operation of the invention being modified. The Examiner asserts that those of ordinary skill in the art would use the square wave generator disclosed by Wallrafen in the device disclosed by Pinto to eliminate ripple in the output waveform. However, one of ordinary skill in the art would not be motivated to combine Wallrafen with Pinto because it would change the principle of operation of Pinto from having an oscillating output signal to having a DC output signal.

The combination would change the principle of operation because Pinto uses the sensor capacitor as part of a tank circuit. Wallrafen uses the sensor capacitance in combination with a capacitor to form a voltage divider that serves as two legs of a

differentially driven half-bridge measurement configuration. The two cannot be combined without changing the principle of operation of Pinto.

Dependent claims 15 – 19 are also allowable for the aforementioned reasons. Dependent claims 15 – 19 are also allowable because the Examiner has failed to point out where Pinto includes all of the limitations recited in claim 1. This point was discussed in detail in Section 5, above.

In light of the above arguments, the Applicants respectfully assert that claims 15-19, and 21 - 30 are allowable under 35 U.S.C. § 103(a). Applicants respectfully request that the rejection under 35 U.S.C. § 103(a) be withdrawn.

C. The Examiner has rejected claims 31 – 35, 37 – 40, and 46 – 48 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Pinto in view of Frick.

Claim 31 is directed to a capacitive sensor system for measuring a stimulus parameter. The system includes a circuit board having at least one metallic layer disposed therein. A metallic diaphragm is coupled to the circuit board to thereby form a variable capacitor. The variable capacitor is characterized by a variable capacitance. The metallic diaphragm is adapted to move relative to the at least one metallic layer in response to a change in a stimulus parameter, such that the capacitance is varied in accordance with stimulus parameter changes. An oscillator circuit is disposed on the circuit board and coupled to the variable capacitor. The oscillator circuit includes a low-pass filter configured to generate a filtered signal characterized by a frequency that changes in accordance with capacitance changes. A processor is coupled to the oscillator circuit. The processor is configured to derive a value of the stimulus parameter from the frequency.

Both Pinto and Frick were discussed in detail above.

<u>i.) The prior art references do not teach or suggest all the claim limitations.</u>

<u>Claim 31:</u>

As pointed out in Section 5, in the discussion of claim 1, Pinto does not include a circuit board having a metallic layer nor an oscillator having a low pass filter. Pinto also does not have an oscillator disposed on a circuit board. As shown in Figure 5 and Figure 6, and

disclosed in col. 7, lines 30 – 32, the electrical signals are provided to oscillator 136 by leads 129 and 131. As noted above, the sensor itself does not include any electronics disposed therein.

Frick does not remedy the deficiencies associated with Pinto.

<u>ii.) There is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.</u>

The Examiner argues that one of ordinary skill in the art would be motivated to combine Frick with Pinto for the purpose of calculating information with the microprocessor.

Again, the Applicants point out that MPEP 2143.01 states that a proposed combination cannot change the principle of operation of the invention being modified. In this case, Pinto is designed to provide an analog oscillating voltage that has a frequency that is proportional to pressure. Frick calculates a digital output value. One of ordinary skill in the art would not be motivated to use Frick's processor in Pinto, because it would change Pinto from an analog system into a digital system.

Dependent claims 32 – 48 are allowable in their own right. In light of the above arguments, the Applicants respectfully assert that claims 31 – 48 are allowable under 35 U.S.C. § 103(a). Applicants respectfully request that the rejection under 35 U.S.C. § 103(a) be withdrawn.

7. Conclusion

Based upon the above amendments, remarks, and papers of record, Applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests reconsideration of the pending claims 1 – 62 and a prompt Notice of Allowance thereon.

Applicant believes that no extension of time is necessary to make this Response timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Response timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 50-0289.

Please direct any questions or comments to Daniel P. Malley at (607) 256-7307.

Respectfully submitted,

WALL MARJAMA & BILINSKI

Date: 7/9/03.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

1. Please replace the last paragraph on page 1 of the Specification with the following amended paragraph:

The electronic circuit used in the conventional approach employs a three-inverter oscillator circuit that converts the capacitance of the capacitive transducer to a square wave. The frequency of the square wave is easily measured by a microprocessor, or by some other means. Figure 1 is an electrical schematic of a conventional three-inverter oscillator circuit. The circuit includes three inverter gates G1, G2, and G3. Typically, each gate includes protection diodes. The biggest problem with the circuit depicted in Figure 1 is the conduction of the input protection diodes of the threshold detector stage G1. In order to mitigate the effects of the diode conduction, the conventional design employs resistor R3. Depending on its value, R3 either reduces or eliminates the diode conduction. However, as R3 reduces diode errors, it amplifies errors introduced by other components in the oscillator. The direct effect is increased sensitivity to changes in capacitance of the internal circuit at the input of gate G1 [42], thus affecting frequency stability. The group delay of the low-pass filter created by R3 and the input capacitance of G1 causes the sensitivity to most other errors in the sensor to be increased. The ideal situation is where no delays are added to the signal path. The introduction of R3 also changes the effective threshold voltage (V_{th}) of gate G1. The conventional design has other problems as well. The circuit board that is used to support the electronics and the means used to support the plates of the variable capacitor C1 include dielectric material that contributes to inter-plate capacitance between the nodes of the circuit, especially between plates of the capacitor C1. Because the dielectric constant of the circuit board supports varies with temperature, the conventional sensor is sensitive to changes in temperature.

2. Please replace the second paragraph on page 8 of the Specification with the following amended replacement paragraph:

As embodied herein, and depicted in Figure 3, a cross-sectional view of capacitive pressure sensor 10 in accordance with the present invention is disclosed. Sensor 10 includes metallic conductor layer 18 formed on a surface of circuit board 12. Ground conductor layer

20 is disposed on the opposite surface of circuit board 12. Circuit board 12 also includes dielectric material 22, disposed between conductor layer 18 and ground layer 20. Metal ring 24 is connected to circuit board 12 by pins 38, which are inserted through ring conductor 14. Metal ring 24 receives structural support from support plate 40, which is disposed between circuit board 12 and metal ring 24. Support plate 40 causes conductor layer 18 and the support plane of metal ring 24 to be co-planar, to thereby reduce mechanical tolerance stack-up. Metallic diaphragm 30 is coupled to circuit board 12 by being sandwiched between metal ring 24 and O-ring 26. Thus, metallic diaphragm 30 is disposed over circuit board 12 and juxtaposed to conductor layer 18 to form a variable capacitor. This design feature also has the effect of reducing mechanical tolerance stack-up. Metallic diaphragm 30 is held in place by O-ring 26. O-ring 26 is pressed against metallic diaphragm 30 and metal ring 24 by snap-on cap 32. Snap-on cap 32 includes multiple snaps 36 which fit over the edge of metal ring 24. Snap-on cap 32 also includes pressure port 34. In the embodiment depicted in Figure 3, the electronics (oscillator 50, measurement and processor circuit 70, and reference oscillator 200) of sensor 10 are coupled to the underside of circuit board 12.

In the Claims

Please amend claims 4, 16, 23, 36, and 50 as indicated below:

4. The sensor of claim 3, wherein the pressure port assembly further comprises:

a snap-on cap coupled to the conductive ring; and

a compressible sealer element disposed between the snap-on cap and the metallic diaphragm, whereby substantially symmetrical forces are applied to the metallic diaphragm to thereby seal the cavity.

16. The sensor of claim [11]15, wherein the low-pass filter includes a series impedance element coupled to the input of the transducer, and a capacitor disposed between an output of the transducer and AC ground to thereby form a voltage divider.

23. The sensor of claim 21, wherein the [environmental]stimulus parameter is fluid pressure.

36. The system of claim [31]32, further comprising a ground conductor layer disposed on a second surface of the circuit board parallel to the surface of the circuit board, whereby the ground conductor layer and the metallic diaphragm shield the two co-planar rings from AC-signals.

50. The method of claim 49, wherein the step of determining further comprises the steps of:

obtaining an initial condition factory oscillation frequency value (f_0);

obtaining an initial condition ambient [condition]oscillation frequency value (f_1); and

dividing the initial condition factory oscillation frequency value by the initial condition ambient [condition]oscillation frequency value.